



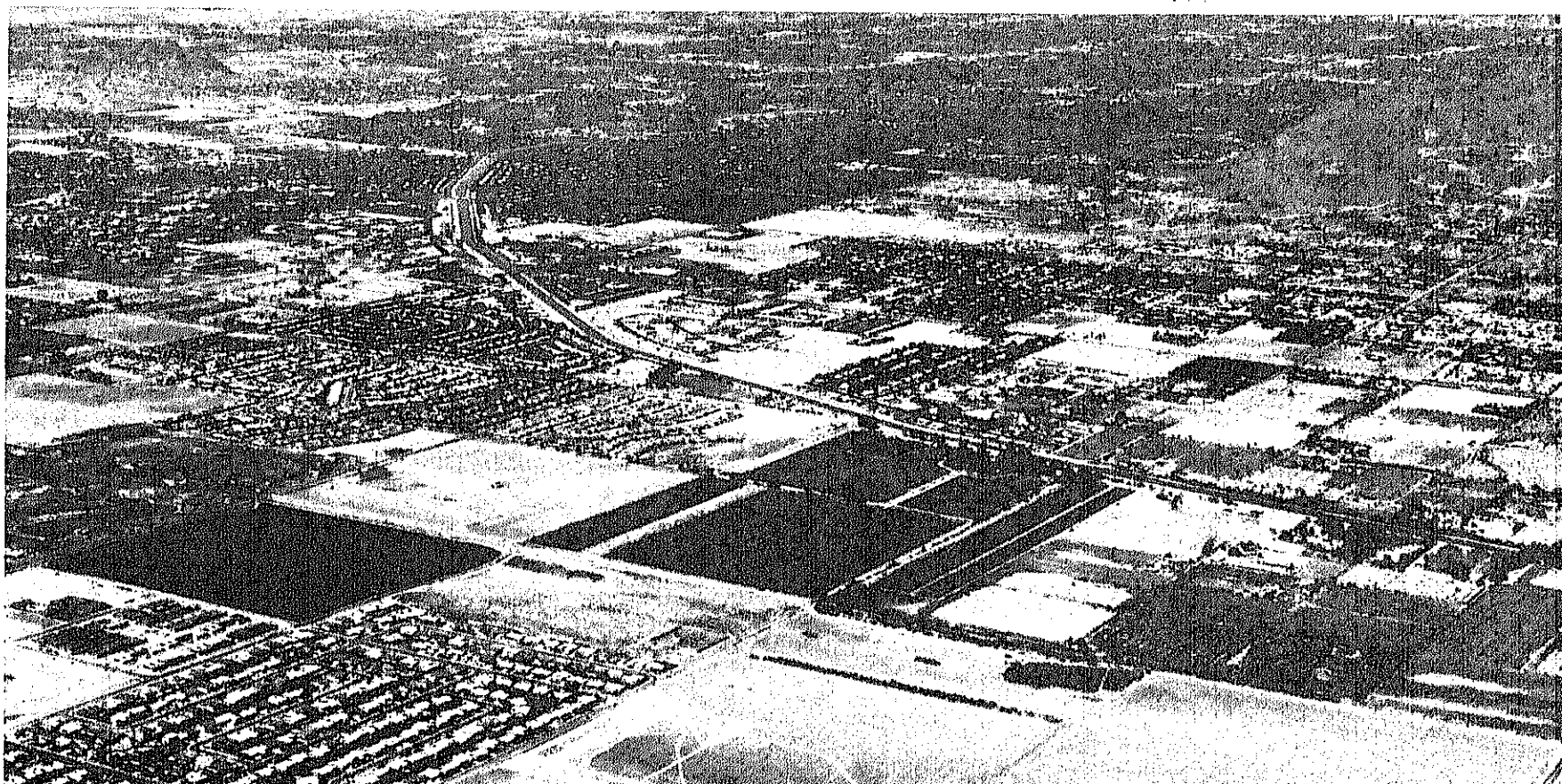
United States  
Department of  
Agriculture

# Arizona's Land and Water

Soil  
Conservation  
Service

## The 1982 NRI Data

July 1985



## FOREWORD

How severely has erosion damaged our soil and water? Will the United States continue to have the ability to produce food and fiber for itself and others? How big are Arizona's land and water conservation needs?

These and many other questions continually concern resource managers. The data gathered in the 1982 National Resources Inventory (NRI) provides many of the answers. When the data is compared to earlier inventories, it is possible to discern some trends on land use.

The data presented here covers only the Arizona part of the NRI. It is limited to nonfederal lands or about 56 percent of the state.

We invite you to use this material as a basis for making land use decisions or identifying the need for conservation treatment programs. The Soil Conservation Service, gatherers of much of this data, stands ready to assist you in both using this material and developing programs to treat Arizona's conservation needs.

Please contact us at any of our 25 area or field offices or at the state office if you would like any help. Our address and phone number is:

201 E. Indianola, Suite 200  
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(602) 241-2247



Verne M. Bathurst  
State Conservationist

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## ARIZONA'S LAND AND WATER THE NATIONAL RESOURCES INVENTORY

### Introduction

The Soil Conservation Service (SCS) has long recognized the continuing need for current natural resource data. The 1982 National Resources Inventory (NRI) is the latest in a series of resource surveys conducted by the Soil Conservation Service. Others were the 1958 and 1967 Conservation Needs Inventory (CNI), the 1975 Potential Cropland Study, and the 1977 National Resources Inventory. The 1982 NRI is the most exhaustive and extensive study of natural resources ever made by the SCS.

The 1982 NRI data gives an appraisal of the status, condition, and trends in use of soil, water, and related resources. The inventory includes all nonfederal land, including Indian Reservations. This represents about 56 percent of Arizona. The Soil and Water Resources Conservation Act of 1977 (RCA) required that this inventory be made.

The Soil Conservation Service and others involved in natural resource conservation will use these data to develop resource appraisals, to document program needs, to develop programs and practices to meet identified needs, and to target program efforts for Arizona.

Caution should be used in comparing 1982 NRI data with preceding inventories because different sampling levels and techniques were used to gather the data. This inventory identifies only sheet, rill, and wind erosion. It does not identify gully and streambank erosion.

Highlights of the inventory include the following facts:

--Range is the dominant land use in Arizona. About 74 percent of the nonfederal rangeland needs erosion control, forage protection, range improvement, and other management.

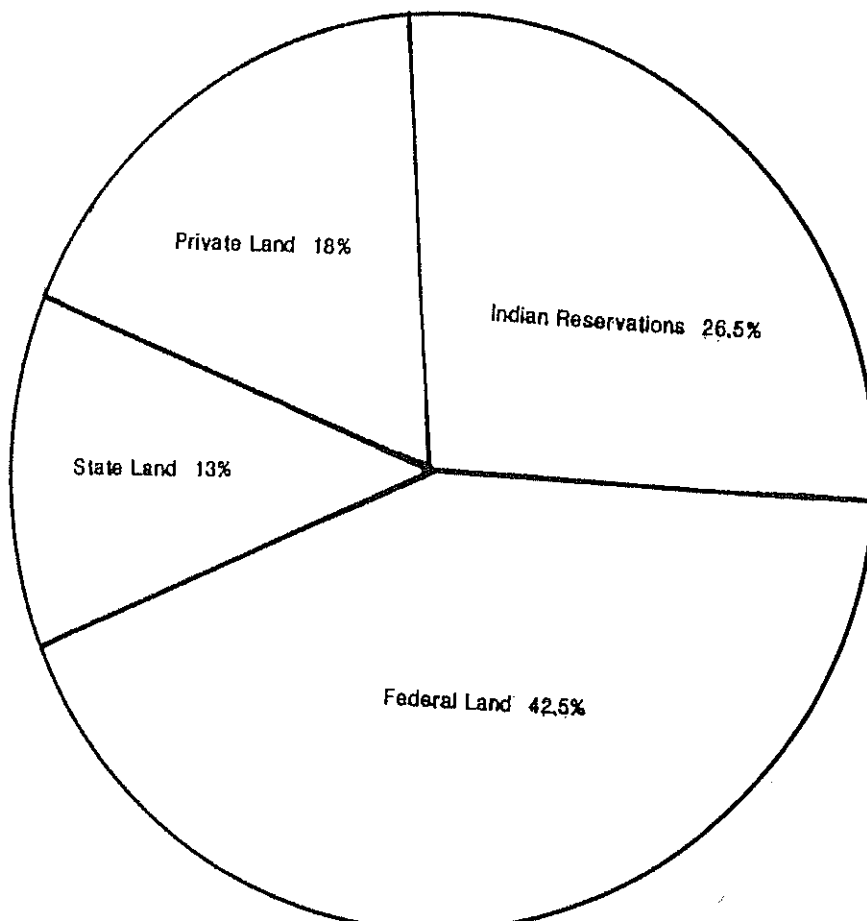
--Nearly 85 percent of the cropland and pastureland in Arizona is prime farmland.

--Nearly 30 percent of the irrigated cropland is adequately protected; however, over 55 percent of the irrigated cropland needs irrigation management or other water conservation measures.

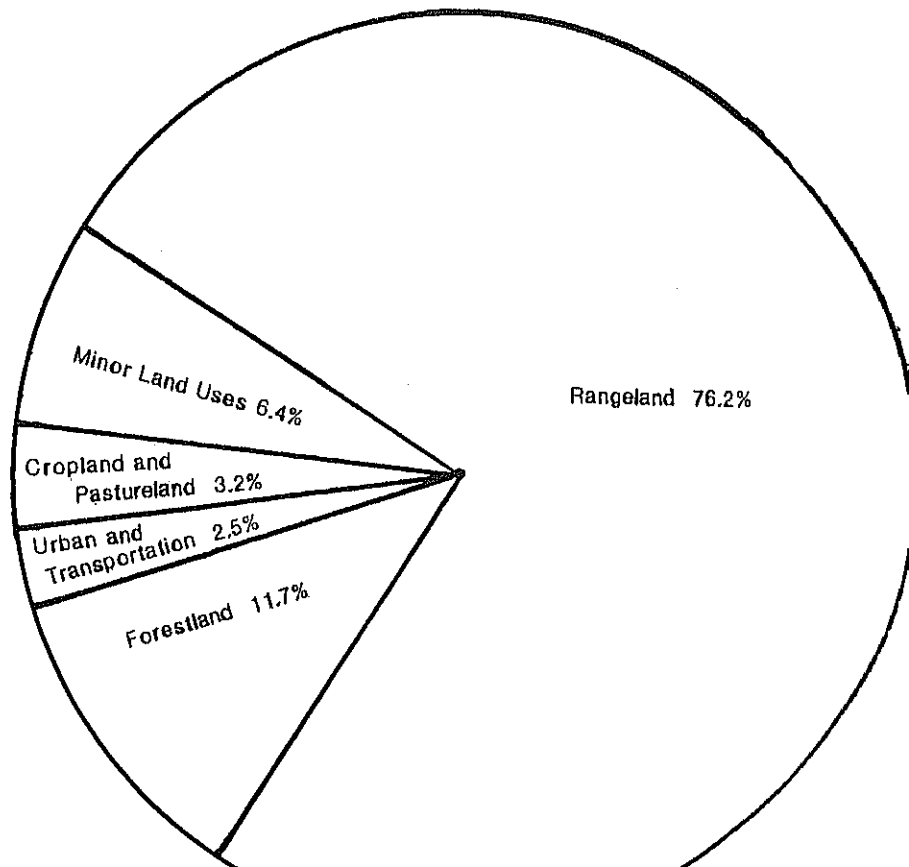
--Arizona had 1.6 million acres of cropland in the 1958 CNI, 1.5 million acres in the 1967 CNI, 1.3 million acres in the 1977 National Resources Inventory, and 1.2 million acres in the 1982 NRI. The reduction in cropland has largely been a shift to urban and built-up land.

## Arizona Land Ownership

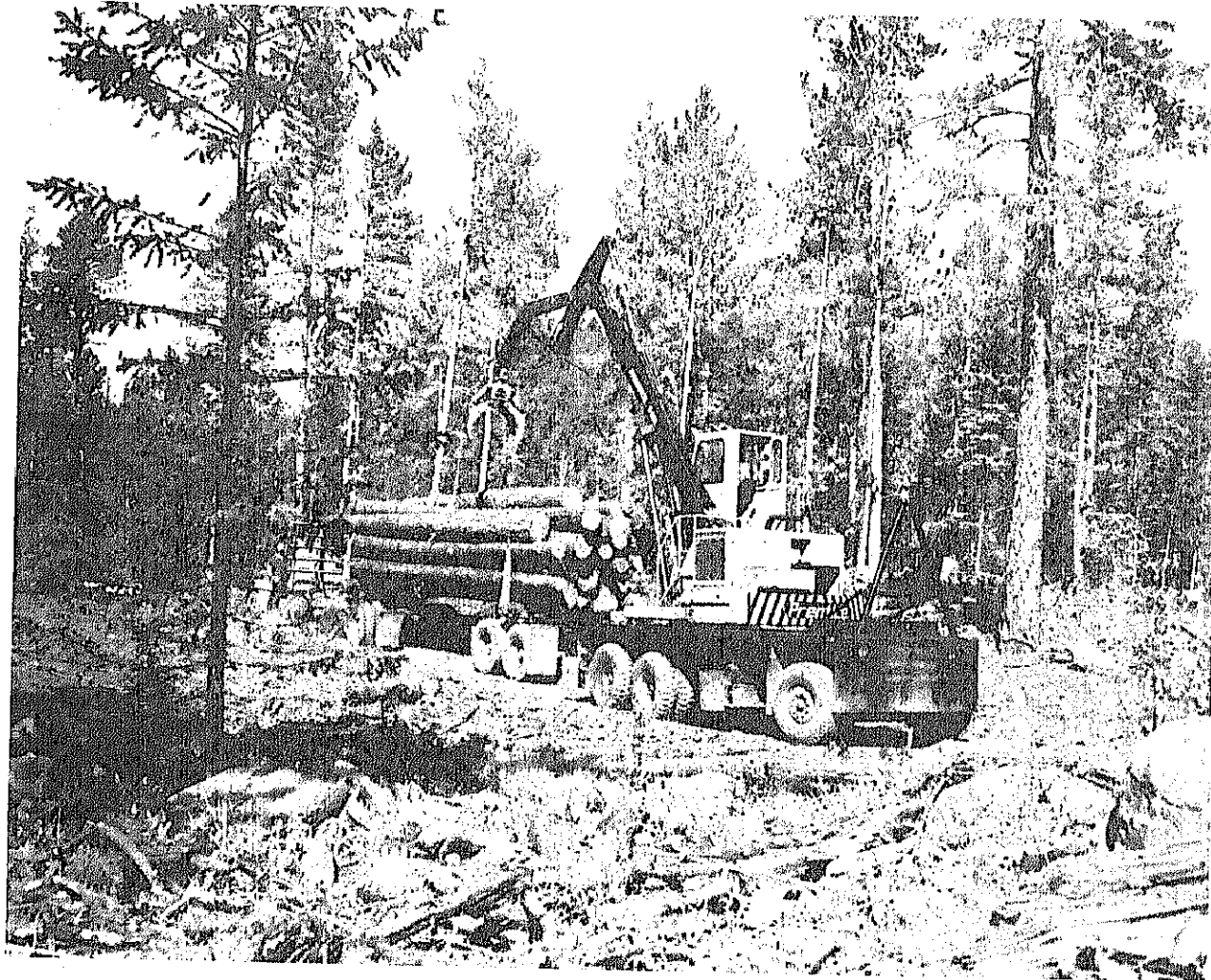
72,659,700 Acres



**ARIZONA LAND USE**  
**of**  
**Nonfederal Land**



## FOREST LAND



About 6.6 percent (4,760,200 acres) of the nonfederal land in Arizona is forest land. The forest land varies from ponderosa pine or mixed conifers to pinyon-juniper. The largest contiguous ponderosa pine forest is in

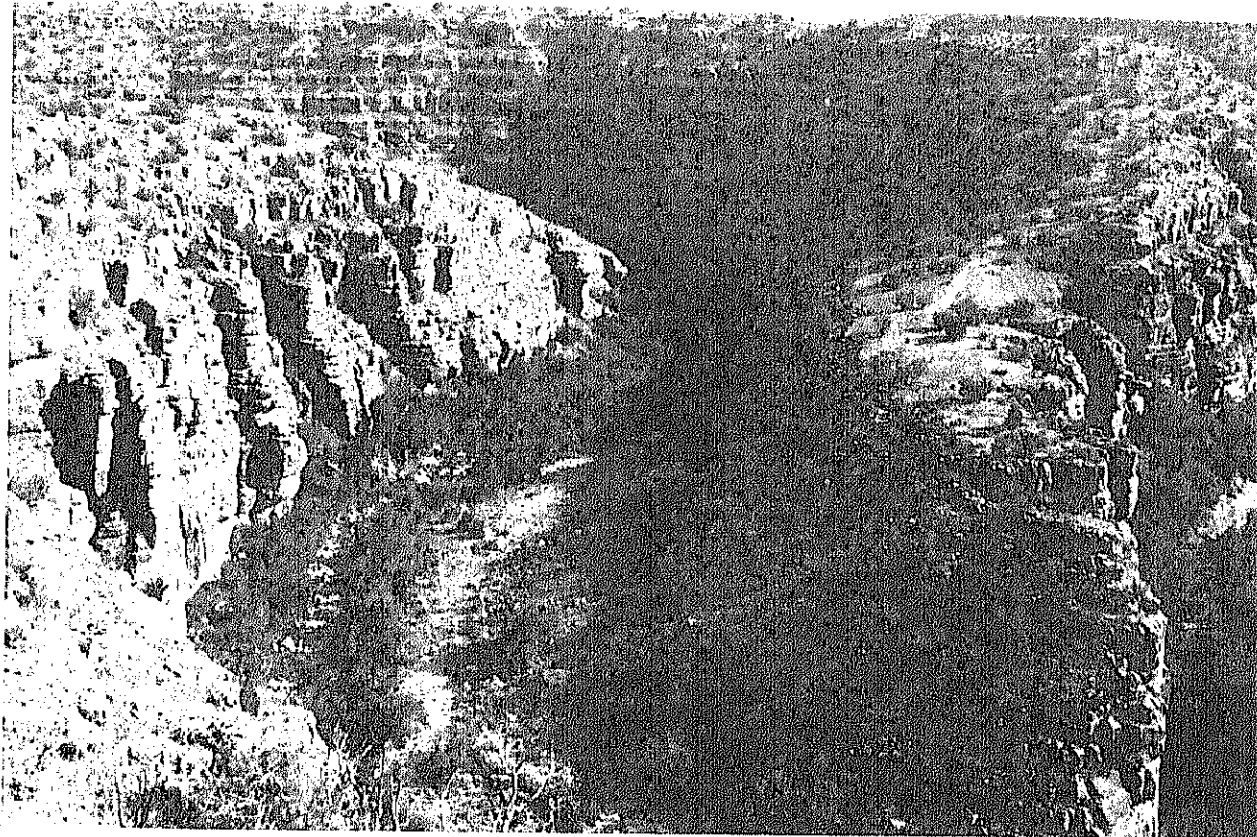


## URBAN AND BUILT-UP LAND



About 1.4 percent (1,021,000 acres) of Arizona consists of urban and built-up land, rural transportation and small water areas. The major urban centers compete with agriculture for the use of water in this water deficient state.

## MINOR LAND USES



About 3.5 percent (2,588,400 acres) of the nonfederal land in Arizona has minor land/cover uses. Mostly this land consists of bare exposed rock or other barren land. Conservation treatment is not feasible on most of this land.

State: ARIZONA

1982 NR1 - July 1984

Table 1a. Surface area of nonfederal and federal land and census water, by county.

County	Nonfederal	Federal	Census Water	Total
- - - - - 1,000 acres - - - - -				
Apache	6,482.8	692.3	5.9	7,181.0
Cochise	3,026.4	953.4	0.0	3,979.8
Coconino	7,263.5	4,645.4	37.7	11,946.6
Gila	1,258.1	1,783.4	25.7	3,067.2
Graham	743.3 <sup>1/</sup>	2,220.1 <sup>2/</sup>	13.9	2,977.3
Greenlee	227.2	948.3	0.0	1,175.5
Maricopa	2,403.0	3,438.2	62.6	5,903.8
Mohave	2,460.4	6,042.2	119.0	8,621.6
NavaJo	5,769.1	599.9	5.3	6,374.3
Pima	4,224.0	1,656.1	0.1	5,880.2
Pinal	2,694.0	741.4	3.8	3,439.2
Santa Cruz	371.5	420.5	0.3	792.3
Yavapai	2,644.4	2,544.6	2.1	5,201.1
Yuma	1,035.7	5,360.5	23.9	6,420.1
<b>Total</b>	<b>40,603.4 <sup>3/</sup></b>	<b>32,056.3 <sup>4/</sup></b>	<b>300.3</b>	<b>72,960.0</b>

<sup>1/</sup> The correct area of nonfederal land for Graham County should be 1,802.3

<sup>2/</sup> The Indian lands in Graham County were inadvertently considered as federal land. The correct area of federal land should be 1,161.1.

<sup>3/</sup> The correct area of nonfederal land for Arizona should be 41,662.4.

<sup>4/</sup> The correct area of federal land for Arizona should be 30,997.3.

## GLOSSARY

### Glossary for SCS National Resources Inventory

**Alkali soil.** A soil that contains sufficient exchangeable sodium (15 percent or more) to interfere with the growth of most crop plants. Also called a sodic soil.

**Aquaculture.** The controlled cultivation and harvest of aquatic animals and plants. (Aquaculture, A Program for the Eighties, USDA, Washington, D.C., December 26, 1979.)

**Barren land.** Areas that have limited capacity to support life and that have less than 10 percent vegetative cover. In general, barren areas have sand, rocks, or thin soil. Vegetation, if present, is more widely spaced and scrubby than that in rangeland. Examples include dry salt flats, active dunes, mud flats, beaches, bare exposed rock, strip mines, quarries, gravel pits, and borrow pits.

**Basal area.** The area in square feet, including bark, of a cross section of a tree taken 4.5 feet above the average ground level. Some species such as mesquite, pinyon, and juniper are measured 1 foot above ground level. The basal area of a stand is the sum of the cross-sectional areas of the trees. It is usually expressed as square feet of basal area per acre.

**Built-up land.** (See Urban and built-up land.)

**Canopy cover.** The ground area covered by the vertical projection downward of the leaves and branches of the tops or crowns of plants, usually expressed as a percent of the area.

Canopy cover is used in the '82 NRI (1) under pasture and rangeland as canopy cover, woody: the percent of ground area covered by the perimeter of the aerial part of trees and shrubs; and (2) under forest land as canopy cover.

perimeter of the aerial part of trees.

**Commercial land.** Land used for wholesale and retail sale of goods and services, such as urban business districts, shopping centers, business developments along highways, and junkyards.

**Conservation practices.** Measures used to meet specific needs in carrying out soil and water conservation programs for which standards and specifications have been developed. Definitions, standards, and specifications are included in the National Handbook of Conservation Practices.

**Critical eroding areas.** Sites that are losing excessive amounts of soil and producing high sediment yields. Stabilizing critical eroding areas usually requires complex conservation treatment and management in addition to vegetative practices. Examples are denuded or gullied areas such as may occur on cropland, mine spoil, skid trails, roadside ditches, and cuts or fills.

**Cropland.** Land used for the production of adapted crops for harvest, alone or in rotation with grasses and legumes, includes row crops, small grain crops, hay crops, nursery crops, orchard crops, and other similar specialty crops.

**Crop production land.** Land used for the production of food, feed, forage, oil, horticulture, and fiber crops other than wood.

**DBH (diameter, breast height).** The diameter of a tree (including bark) 4.5 feet above the average ground level.

**Double-cropping.** The growing for harvest of more than one crop on the same field in the same year. The term usually applies to growing one crop and then planting the second

the rows of trees or vines in an orchard or vineyard. Planting and harvesting two species at the same time is not considered double-cropping. Winter cover crops and green manure crops are excluded.

**Degree of erosion.** The relative extent of soil loss that has occurred in an area. Resource inventories divide erosion into the following degrees:

**Code Degree of erosion**

1. None or slight - Accelerated erosion has not greatly altered the thickness and character of the A horizon. There may be a few rills, some deposits of windblown sediment near plants or clods, or places with thin A horizons that indicate slightly accelerated erosion is taking place.
2. Moderate - Accelerated erosion has reduced the thickness and character of the A horizon. In cultivated areas, the soil has been eroded to the extent that ordinary tillage implements reach through the remaining A horizon, or well below the depth of the original plowed layer in soils with thin A horizons. Approximately 25 to 75 percent of the original surface soil has been removed by erosion from most of the area. There may be a few shallow gullies, scoured or blown out areas, or evidence of soil drifting.
3. Severe - the soil has been eroded to the extent that all or practically all of the original surface soil has been removed. The surface layer consists essentially of materials from the B horizon or other underlying horizons. Severe gullying, scouring, drifting, or dune development is included.

splash, flowing water, wind, or other geological agents including gravitational creep. Erosion is sometimes classified (1) as natural or geologic erosion or as accelerated erosion, which is induced by activities of man, (2) by primary agent: wind or water erosion, (3) by degree: slight, moderate, or severe, (4) by the resulting surface characteristic: sheet, rill, or gully erosion, and (5) by the type of land eroding: e.g. streambank erosion, cropland erosion, beach erosion, roadside erosion. (See Degree of erosion.)

**Farmstead.** That part of a farm or ranch that is occupied by the dwellings, buildings, adjacent yards or corrals, and family gardens and orchards. Land in farmsteads or ranch headquarters includes land used for barns, pens, corrals, and feedlots next to buildings, farmstead or feedlot windbreaks, and family gardens associated with operating farms and ranches. Commercial feedlots, greenhouses, broiler facilities, etc., are not recorded as farmsteads. Also exclude overnight pastures for livestock and field windbreaks.

**Farmstead or feedlot windbreak.** A belt of trees or shrubs established to protect a farmstead or feedlot against the force of wind.

**Field windbreak.** A strip of trees or shrubs established to protect a field against the force of wind.

**Floodprone area (flood plain).** The lowland and relatively flat areas adjoining inland and coastal waters that are subject to a 1 percent or greater chance of flooding in any given year (floods having an average recurrence interval of one or more in 100 years). Includes areas adjoining rivers, streams, watercourses, bays, and lakes. Does not include depressional areas in the uplands that are temporarily ponded.

**Forest land.** Land at least 10 percent stocked by forest

and not currently developed for nonforest use. The minimum area for classification of forest land is 1 acre and must be at least 100 feet wide. (Use 10 percent tree canopy cover to separate forest land from rangeland in the transition vegetation types.)

**Forest type.** A descriptive term used to group stands of similar character of development and species composition (due to given ecological factors) by which they may be differentiated from other groups of stands. (Soc. Amer. For. 1950. Forestry Terminology. Washington, D.C.)

**Forest understory composition.** A term applied to the types or primary plant group of the understory of forest land. Grouping used in this inventory are:

- 0 None
- 1 Woody
- 2 Forbs
- 3 Grass and grasslike plants

**Hayland.** Arable land managed for the production of forage crops that are machine harvested. These crops may be grasses, legumes, or a combination of grasses and legumes.

**Idle land.** Areas that have been managed or used for a particular purpose but are not now being used. Included are recently abandoned cropland, abandoned feedlots, and areas denuded of natural vegetation, but not yet dedicated to an identifiable land use.

**Impervious urban and built-up areas.** Areas within cities, towns, and other built-up areas where the land surface is under a hard cover that virtually excludes intake of water. Includes roofs, sidewalks, etc.

**Industrial land.** Land used primarily for the manufacture of goods and the facilities that support such manufacture.

hospital complexes, and certain religious complexes. Agricultural, forested, and range areas that are operated by institutions would be categorized in their respective land use category rather than institutional.

**Irrigation.** The application of water to soil by artificial means for the purpose of plant production.

**Kuchler cover type.** The potential natural vegetation based on a map and classification system produced by A. W. Kuchler at the University of Kansas and published by the U.S. Geological Survey. Latest edition is 1966.

**Lake.** An inland body of standing water, usually freshwater. In resource inventories, a lake is a natural body of water larger than 2 acres.

**Land capability class and subclass.** A grouping of soils according to their potential and limitations primarily for sustained production of crops and pasture. The capability class is the broadest group that classifies soils from I to VIII according to the risks of land damage or limitations in use. The risk of soil damage or limitations in use become progressively greater from class I to class VIII. The subclass is a group of soils that have the same major conservation problem such as--"e" erosion, "w" wetness, "s" soil condition, or "c" climate. For coding on resource inventories, capability class and subclass are shown by Arabic numeral and capital letter, such as 6E. For details see Land-Capability Classification, U.S. Department of Agriculture, Soil Conservation Service, Agriculture Handbook 210, September 1961.

**Land cover/use.** A descriptive term used in the resource inventory that includes land cover such as forest land, barren land, urban and built up land, water bodies, rural transportation land, and land use such as pastureland, rangeland, and other land in farms.

**Livestock grazing land.** Land used primarily to pasture or herd cattle, sheep, goats, and other foraging animals.

**Major land resource area.** A group of geographically associated land resource units. A land resource unit is an area of several thousand acres that is characterized by particular patterns of soil, climate, vegetation, water resources, land use, and type of farming. For details see Land Resource Regions and Major Land Resource Areas of the United States, U.S. Department of Agriculture, Soil Conservation Service, Agriculture Handbook 296, Revised December 1981.

**Military land.** Land used for training fields, posts, bombing and target ranges, armories, missile installations, and related facilities. Forested areas, agricultural areas, and areas around water installations operated by the U.S. Army Corps of Engineers are designated by their respective land use without regard to the military land ownership if the land is being used for nonmilitary purposes.

**Native pasture.** Land on which the climax vegetation (potential natural plant community) is forest, but which is used and managed primarily for production of native plants for forage. Includes cutover forest land and forested areas that have been cleared and cultivated.

**Nature study (designated) land.** Land used for outdoor classrooms, nature trails, and other areas specifically dedicated for monitoring, measuring, or otherwise learning to appreciate environmental processes. These areas may include several diverse land cover types.

**Nonarable land.** Areas not suited for cultivation or tillage.

land. Other land in farms includes field windbreaks, commercial feedlots, greenhouses, nurseries, broiler facilities, farm landing strips, etc., not associated with farmsteads. Lanes to farmsteads are classified as rural transportation land and excluded from other land in farms.

**Other lands.** A category of land cover and land use in the resource inventory that includes permanent snow and ice fields and any other land that does not fit into any other land cover or use category in the inventory.

**Ownership.** The legal right of use and control; usually includes holding of some form of title when referring to land ownership. Ownership generally includes right to possess, occupy, hold, transfer, sell, mortgage, lease, subdivide, consolidate, use, exploit, conserve, improve, bequeath, and give. These rights are subject to rules and regulations established within society.

Ownership is subdivided into the following types for resource inventories:

1. Private
2. Municipal
3. County or parish
4. State
5. Federal
6. Indian tribal and individual trust lands

**Pastureland.** Land used primarily for production of adapted, introduced, or native forage plants for livestock grazing. Pastureland may consist of single species in a pure stand, grass mixture, or a grass-legume mixture. Cultural treatment in the form of fertilization, weed control, reseeding, or renovation is usually a part of pasture management in addition to grazing management.

**Pastureland condition.** A rating of pastureland that is

resource inventory, the following conditions are assigned: Good, fair, poor, and not applicable. These terms are not to be confused with range condition.

**Perennial stream.** A natural or artificial watercourse through which water normally flows continuously. It may range from a small creek to a major river.

**Pond.** A small body of water. In the resource inventory, a pond is any body of water less than 2 acres.

**Potential cropland.** Land not now being cropped that has the capability of being converted to cropland and managed as cropland on a sustained basis. In the resource inventory, potential for conversion to cropland is determined for all sample points except cropland, urban and built-up land, rural transportation land, water bodies, and soils in capability classes VIIe, w, or s or capability class VIII. Potential is stated as zero, unlikely, medium, or high.

**Primary sample unit (PSU).** A sample unit at the first stage of sampling in a multistage sampling plan. In the resources inventory, the PSU is a tract of land, typically square or rectangular, that is approximately 40, 100, 160, or 640 acres in size. The size of the PSU depends on the shape, size, and complexity of the resources being inventoried.

**Prime farmland.** Land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses. The present land use could be cropland, pastureland, rangeland, forest land, or other land but not urban or built-up land or water.

Prime farmland soils meet all the following criteria:

(1) have adequate and dependable water supply from precipitation or irrigation, (2) have a favorable temperature and growing season, (3) have acceptable acidity or alkalinity, (4) are not saturated with water during the

are not flooded during the growing season, (7) are not highly erodible, (8) are permeable to air and water, and (9) contain few or no coarse fragments. More detailed criteria for prime farmland are given in the Federal Register, Vol. 43, No. 21, Tuesday, January 31, 1978.

**Rangeland.** Land on which the climax vegetation (potential natural plant community) is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing and browsing. Includes natural grasslands, savannas, many wetlands, some deserts, tundra, and certain forb and shrub communities. Also includes areas seeded to native or adapted introduced species that are managed like native vegetation.

**Reservoir.** Impounded body of water in which water is controlled, collected, or stored. In the resource inventory, a reservoir is a manmade body of water larger than 2 acres.

**Range condition.** The present state of vegetation compared to the climax vegetation (potential natural plant community) for a site. It is the relative degree to which the kinds, proportion, and amounts of plants in the present plant community resemble that of the climax vegetation for the site, and is expressed as a percentage. Range condition is usually expressed as one of four classes. Excellent, over 75 percent; good, 51-75 percent; fair, 26-50 percent; and poor, 0-25 percent.

**Recreation (designated) land.** Land designated to be used for sports and other leisure activities. This includes those lands clearly set aside, dedicated, or otherwise identified as recreation land.

**Research and experimentation land.** Land used for research farms, experiment stations, etc.



**Riparian land.** The bank, shoreline, or edge of the rising ground bordering a natural, modified, or manmade watercourse or water area.

**Rural transportation land.** A category of land cover and land use in the resource inventory that includes all highways, roads, and railroads outside urban and built-up areas. Also includes private roads to farmsteads, logging roads, and other private roads, but not field lanes.

**Saline soil.** A nonsodic soil containing sufficient soluble salts to impair its productivity, but not containing excessive exchangeable sodium. Electrical conductivity of the saturation extract exceeds 4 mmhos/cm.

**Soil loss tolerance.** The maximum average annual soil loss expressed as tons per acre per year that will permit high level production economically and indefinitely.

**Transmission land.** Land used as right-of-way for pipelines, power lines, telephone lines, and other communications or utilities and related facilities. Long distance transmission lines or buried pipelines seldom constitute the primary or dominant use of the lands with which they are associated.

**Treatment needs.** Changes in land use, management, and conservation practices required to protect the land and water resources.

**Tundra.** The treeless land in arctic and alpine regions; varying from bare area to various types of vegetation consisting of grasses, sedges, forbs, dwarf shrubs, mosses, and lichens. (Soil Conservation Society of America, 1976 Resource Conservation Glossary, Ankeny, Iowa).

**Urban and built-up land.** Land used for residences, industrial sites, commercial sites, construction sites,

yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment plants, water control structures and spillways, etc. Highways, railroads, and other transportation facilities are counted as part of urban and built-up land if they are surrounded by other urban areas. If roads or railroads form the boundary of an urban area one-half of the area is counted as urban and one-half as rural transportation. Small parks (less than 10 acres in size) within built-up areas are included with urban and built-up land.

In the resource inventory, urban and built-up land is in contiguous units of 40 acres or larger. Generally the density averages one or more residences or other structures per 1.5 acres; in strip developments the density is 20 or more residences or other structures per mile.

Does not include strip mines, borrow pits, gravel pits, farmsteads, and ranch headquarters. Also does not include commercial feedlots, green houses, broiler facilities, etc., as they are a part of the agricultural land. (See also impervious urban and built-up areas.)

**Use of land.** The kind of activity that takes place on the land. Examples are crop production, timber production, recreation, grazing, and residential use. A particular land use may have a number of different land covers. For example, an area used for recreation may have a land cover of forest or grass.

**USLE (Universal Soil Loss Equation).** An erosion model designed to compute the longtime average soil losses from sheet and rill erosion under specified conditions. It does not predict deposition and does not compute sediment yields from gully, streambank, and streambed erosion. The soil loss equation is  $A = RKLS$ , where A is the computed soil loss per unit area, R is the rainfall factor, K is the soil erodibility factor, L is the slope length factor, S is the slope steepness factor, C is the cover and management

in the publication: USDA-SEA. 1978. Predicting Rainfall Erosion Losses. Agriculture Handbook 537.

**Waste disposal land.** Land used to dispose of wastes in landfills, sludge pits, dumps, settling basins, and other areas.

**Water bodies.** The area of the Earth's surface covered by open permanent water such as lakes, ponds, reservoirs, bays, and estuaries.

**Water Resources Council hydrologic unit.** A specific drainage area that is represented by a unique 8-digit number. All areas of the United States have been subdivided into hydrologic units. These units are aggregated into subregions and then into regions.

**Wetlands.** Land where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. The single feature that most wetlands share is soil or substrate that is at least periodically saturated with or covered by water.

In the resource inventory, wetlands are classified into wetland types and wetland systems. See definitions of wetland type and wetland system.

**Wetland type.** A classification of wetlands primarily for their usefulness as habitat for waterfowl. Twenty types of wetlands are grouped under four categories: Inland fresh areas (types 1-8), Inland saline areas (types 9-11), Coastal fresh areas (types 12-14), and Coastal saline areas (types 15-20). The 20 wetland types are defined in Circular 39, Wetlands of the United States, by Shaw and Fredline, 1956, Department of Interior, Fish and Wildlife Service.

**Wetland system.** The broadest category in the Fish and Wildlife Service's (FWS) classification of wetlands and deep water habitats (FWS Publication FWS/OBS 70/31, December

1979). The term refers to a complex of wetlands and deep water habitats that share the influence of similar hydrologic, geomorphologic, chemical, or biological factors. The five systems are marine, estuarine, riverine, lacustrine, and palustrine.

**Wilderness (designated) land.** Land to provide isolation from sights and sounds associated with modern living; having the general appearance of being unaltered from its natural state by commercial, industrial, or agricultural activities. Only those areas dedicated to the protection of the wilderness features or designated for use by limited access for the appreciation of the wilderness characteristics are assigned to this land use.

**Wildlife (designated) land.** Land set aside by law for the primary purpose of producing or maintaining wildlife, regardless of whether the land is suitable for other uses.

**Wildlife habitat.** Land, water, vegetation, and other environmental elements that provide diversity, shelter, and food required by one or more species of wildlife.

**Windbreak.** A planted vegetative barrier used to reduce or check the force of the wind to protect a given area. (See Farmstead or feedlot windbreak and Field windbreak.)

**Wind erosion equation.** An erosion model designed to estimate average annual soil loss from wind erosion.

The amount of erosion,  $E$ , expressed in tons per acre per year that could occur from a given agricultural field is expressed as  $E=f(I,K,C,L,V)$ , where  $I$  is a soil erodibility index,  $K$  is soil ridge roughness factor,  $C$  is a climatic factor,  $L$  is field length along the prevailing wind erosion direction, and  $V$  is the equivalent quantity of vegetative cover. Details are in Agriculture Handbook 346, Wind Erosion Forces in the U.S. and Their Use in Predicting Soil Loss, by E. L. Skidmore and Woodruff, 1968, U.S. Department of Agriculture, Agricultural Research Service.

**Wood production land.** Land used to grow tree species primarily for the production of wood crops, whether or not harvesting is planned. Includes Christmas tree plantations.

## REFERENCES

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- (3) United States Department of Agriculture. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210, 21 pp.
- (4) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.
- (5) United States Department of Agriculture. 1981. Land resource regions and major land resource areas of the United States. U.S. Dep. Agric. Handb. 296, 156 pp., illus.

## Appendix A: Inventory Procedure and Accuracy

The 1982 National Resources Inventory (NRI) was designed to obtain natural resource data usable for analysis at a substate (multi-county) level. Estimates based on Major Land Resource Areas (MLRA's), SCS Administrative Areas, sub-river basins, and Water Resources Council aggregated subareas (ASA's). The NRI sample was selected giving particular attention to MLRA's.

Samples for the 1982 NRI were selected using the standard statistical techniques of stratification, area sampling, and clustering. Stratification subdivides the universe of interest (in this case, all nonfederal land, Indian Reservations are considered as nonfederal lands) into strata that are each more homogeneous than the population as a whole. This increases the accuracy of a survey (reduces the sampling variance) in addition to providing several side benefits. In Arizona, the strata for the NRI were 6-mile by 6-mile rectangular-shaped pieces of land, which correspond to 36 sections (one-mile squares) as identified by the public land survey system. The strata were developed on a county by county basis.

Two-stage samples were taken within each stratum. The first-stage sampling unit, or primary sampling unit (PSU), was a square area of land, one-half mile on a side, containing 160 acres, or one-fourth mile on a side, containing 40 acres. At the second stage of sampling, three specific points within each 160 acre PSU or two points within each 40 acre PSU were selected for observation.

The number of PSU's selected within a stratum varied from county to county (and within counties, in some cases). The particular number depended upon several factors, including: the variability of the county relative to land use and soil patterns, the size of the county, and the sizes of the MLRA's in which the county is located. Consideration of these factors was an attempt to balance the field work

load between field offices, while at the same time meeting

the design objectives of the study. The sample for the 1982 NRI consisted of nearly 350,000 PSU's nationally, 2,053 of which were located in Arizona. The sample was designed and selected by the Statistical Laboratory at Iowa State University, in cooperation with SCS.

The basic design criterion used to develop the NRI sample can be expressed quantitatively in terms of the coefficients of variation (or accuracy) of the land use acreage estimates. The sample was selected in a way guaranteeing that the coefficient of variation of an estimate is less than 10 percent if the land use comprises at least 10 percent of the land area within the particular MLRA under consideration. The coefficient of variation is the relative standard error of an estimate and is generally more valuable for comparative purposes than is a standard error or sampling variance. This design criterion can also be expressed in terms of confidence intervals: suppose we estimate that 10 percent of a particular MLRA is prime farmland; then a 95 percent confidence interval for this estimate is at worst 8-12 percent. The coefficient of variation is often much less than 10 percent for such an estimate, and the confidence interval is then proportionately narrower.

When using resource data from the NRI and similar inventories, it is important to realize that each item being estimated has a different level of precision (or reliability). Characteristics that are common and spread fairly uniformly over the region of interest have smaller coefficients of variation than those characteristics that are rare and unevenly distributed. For a multipurpose survey like the NRI, the sample sizes are generally such that common items are estimated more precisely than necessary and rare items less precisely than desired.

Estimates contained in this publication were obtained from

an NRI data base developed using data collected at three levels: 1) the county, 2) the first-stage sampling units (PSU's), and 3) the designated specific points within each sample PSU. Data items collected at the county level on a census basis (not via sampling) were: total surface area subdivided into water area and land area, federally owned land, and rural land area in roads and railroads. These acreages, referred to by SCS as "NRI County Base Data," were determined for each MLRA portion of a county.

Data items collected at the PSU level included acreages in: farmsteads, small built-up areas, small streams, small water bodies, windbreaks, and critical eroding areas. These are small or linear features that would be subject to bias if sampled on a point basis; data collected at the PSU level were area measurements. Also collected for each PSU were acres of urban and built-up land and of large (census) water. The third level of data collection was at the designated sample points with each sample PSU. Most NRI data elements were collected at the point level. All land uses were included at this level, so that data for farmsteads, urban and built-up, water areas, and rural transportation were collected at more than one level.

Field data for the 1982 NRI were collected on nonfederal lands in all U.S. counties (except in Alaska) and in the Caribbean Area by thousands of SCS field employees and by contractors and employees of other agencies under the direction of SCS. The 1982 NRI was designed to collect the most complete set of soil (1,3,4) and water resource data possible consistent with staff and funding availability. Data collected for the 1982 NRI included those items collected by SCS in past national inventories plus items identified during 1978-80 by the public and government agencies as being of major concern.

The 1982 NRI contains millions of useful pieces of information on U.S. nonfederal rural lands. However, data users need to remember that the NRI does not contain information for federal lands. Analyses for areas where

federal lands are significant must take this into account; it is often necessary to find supplemental data on these public lands. Of the 2,053 PSUs in Arizona 433 were on federal lands. These 433 PSUs were not included in the inventory.

The NRI erosion data cannot be used to determine the erosion that actually occurred during 1982. Erosion rates computed from NRI data are estimated average annual (or expected) rates based upon the cropping practices, management practices, and resource conditions over a period of at least four years. The climatic factors entering the erosion prediction equations (models) are based upon long-term average conditions and not upon one year's actual climatic events.

Users of NRI irrigation data need to consider the definitions used for this inventory when making comparisons to irrigation data from other sources. Data collection technicians were instructed to consider an area irrigated if "there is evidence that the land has been irrigated during the year of the inventory or irrigated during two or more years out of the last four years." This means that lands considered irrigated for the 1982 NRI were not necessarily irrigated during 1982.

The estimated average erosion identifies potential erosion rates by sheet, rill, and wind erosion. It does not identify streambank and gully erosion.

On January 1, 1983 the Arizona State Legislature approved the formation of La Paz County from the northern part of Yuma County. This was after all the field work was completed for the 1982 NRI, therefore, La Paz County is not a part of this inventory. The Yuma County data in this inventory covers both Yuma and La Paz Counties.

## Appendix B: Land Capability Classification System

The land capability classification system shows, in a general way, the suitability of soils for growing most kinds of locally adapted field crops (3). The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this inventory. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, e, w, s, or c, to the class numeral, for example, Iie. The letter e shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; w shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); s shows that the soil is limited mainly because it is shallow, droughty, or stony; and c used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by w, s, or c because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

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